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A New Variety of the Mycoheterotrophic Plant *Lecanorchis triloba* (Orchidaceae) from Okinawa Island, Ryukyu Islands, Japan

KENJI SUETSUGU[1,*] AND HIROKAZU FUKUNAGA[2]

*[1]Department of Biology, Graduate School of Science, Kobe University, 1-1 Rokkodai, Nada-ku, Kobe, 657-8501, Japan. *kenji.suetsugu@gmail.com (author for correspondence); [2]Tokushima-shi, Tokushima 770-0852, Japan*

Here we describe a new variety of the mycoheterotrophic genus *Lecanorchis*, *L. triloba* J. J. Sm. var. *clausa* Suetsugu & Fukunaga, discovered during a botanical survey in Okinawa Island, Ryukyu Islands, Japan. The new variety resembles *Lecanorchis triloba* var. *triloba* due to its densely flowered rachis and small fruits. However, the new variety differs in that it has complete cleistogamous flowers and a non-recurved and narrowly triangular midlobe of the lip.

Key words: Japan, *Lecanorchis*, taxonomy

Lecanorchis is a genus of mycoheterotrophic plants characterized by long roots in multiple clusters and erect stems that are either branched or unbranched (Hashimoto 1990, Seidenfaden 1978, Szlachetko & Mytnik 2000, Suetsugu *et al.* 2016a). Another key feature of *Lecanorchis* is the presence of a calyculus, which is a cup-like structure located between the base of the perianth and the apex of the ovary (Hashimoto 1990, Suetsugu *et al.* 2016a). *Lecanorchis* contains over thirty species and/or varieties distributed across a large geographic range that includes China, Indonesia, Japan, Laos, Malaysia, New Guinea, the Pacific Islands, the Philippines, Taiwan, Thailand, and Vietnam (Seidenfaden 1978, Szlachetko & Mytnik 2000, Averyanov 2011, 2013, Vuong & Sridith 2016, Suetsugu *et al.* 2016a). The precise identification of the species of *Lecanorchis* is often complicated by their similar morphology and short flowering period (Suddee & Pedersen 2011, Tsukaya & Okada 2013, Suetsugu *et al.* 2016a). This situation is further compounded by a lack of detailed descriptions for some species, particularly those that were first described several decades ago (Suetsugu *et al.* 2016a, Suetsugu *et al.* 2017a, b). As a consequence of these difficulties, adequate taxonomic studies of *Lecanorchis* have not yet been conducted.

Japan is particularly renowned for its great diversity of *Lecanorchis*, harboring approximately ten species and/or varieties (Hashimoto 1990, Suetsugu *et al.* 2016a, Suetsugu & Fukunaga 2016, Suetsugu *et al.* 2017a, b). Indeed, Japan is remarkably rich in mycoheterotrophic flora as a whole, with recent botanical surveys resulting in the discovery of many new distribution records and taxa of mycoheterotrophic species (Ohashi *et al.* 2008, Yagame *et al.* 2008, Yahara & Tsukaya 2008, Suetsugu 2012, 2013, 2014, 2015a, b, 2016a, b, c, 2017, Suetsugu & Ishida 2011, Suetsugu & Yagame 2014, Suetsugu & Fukunaga 2016, Suetsugu & Nishioka 2017, Suetsugu *et al.* 2012, 2013, 2014, 2016a, b). Considering that these discoveries were made during a limited number of surveys within small study areas, it is likely that more wide-ranging investigations will provide more precise data regarding the diversity and distribution of mycoheterotrophic plants in Japan (Suetsugu 2015b, Suetsugu *et al.* 2016a, b). As anticipated, a recent botanical survey in the lowland evergreen forests of Okinawa Island resulted in the discovery of unknown plants of *Lecanorchis*.

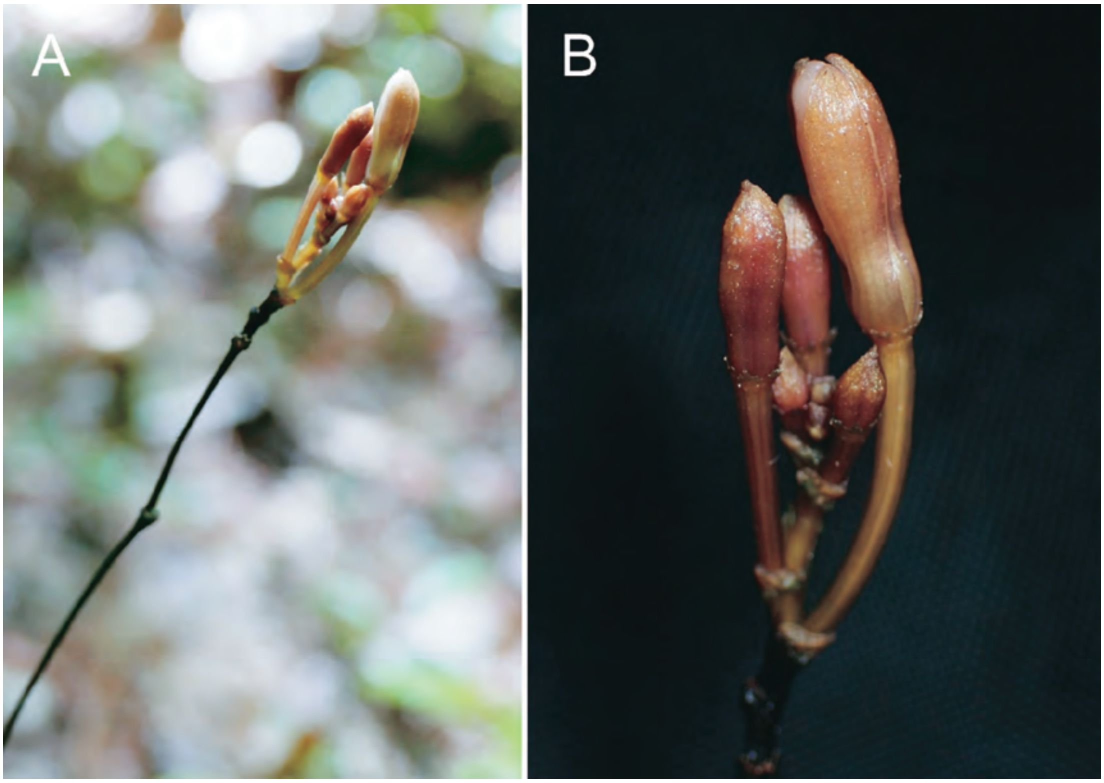

FIG. 1. Flowering plant of *Lecanorchis triloba* var. *clausa* from type locality. A. Habit. B. Flower.

Comparative analysis of their morphology indicated that these individuals represented a new variety of *Lecanorchis triloba* J. J. Sm. Here we provide a description and illustration of the new variety from Okinawa Island.

Lecanorchis triloba J. J. Sm. var. **clausa** Suetsugu & Fukunaga, **var. nov.**——Fig. 1–2.

Typus. JAPAN. Okinawa Pref., Okinawa Island, Kunigami Village, Benoki. 24 August 2016, *K. Suetsugu*, *T. Watanabe*, *H. Watanabe*, *T. Toma s.n.* (holo- KYO, a flower in spirit and a standard dried specimen)

Japanese name. Okinawa-muyou-ran-modoki, nom. nov.

Herbs, terrestrial, mycoheterotrophic. Inflorescence 15–40 cm tall, solitary or branched, slightly tuberculate near nodes, 1–2 mm in diam., with membranaceous scale-like sheaths. Rachis glabrous, 1–3 cm long, 3–10 flowered. Floral bracts ovate, acute, ca. 2 mm long, ca. 1 mm wide. Ovary pedicellate, ascending, 10–15 mm long. Perianth tube never open. Sepals and lateral petals pale yellow, tinged light brownish purple. Sepals similar, oblanceolate-oblong, strongly concave, ca. 10 mm long, ca. 2.5 mm wide when flattened, apex acute. Petals obovate-spatulate, somewhat concave, ca. 10 mm long, ca. 3.3 mm wide when flattened, apex obtuse. Lip trilobed, ca. 10 mm long, ca. 3 mm wide in nature, ca. 5 mm wide when flattened, with 2 calli between side lobes, base adnate to column for ca. 2/3 of the column length; side lobes rounded when flattened, apex not exceeding column; midlobe narrowly triangular, margin irregularly erose-denticulate, ca. 4.5 mm long, ca. 3 mm wide in nature, rounded when flattened, ca. 4.5 mm long, ca. 4.5 mm wide, covered with a dense mass of white hairs except for membranous margin. Column white, clavate, ca. 7.2 mm long, ca. 1 mm wide, slightly curved, papillose on ventral sur-

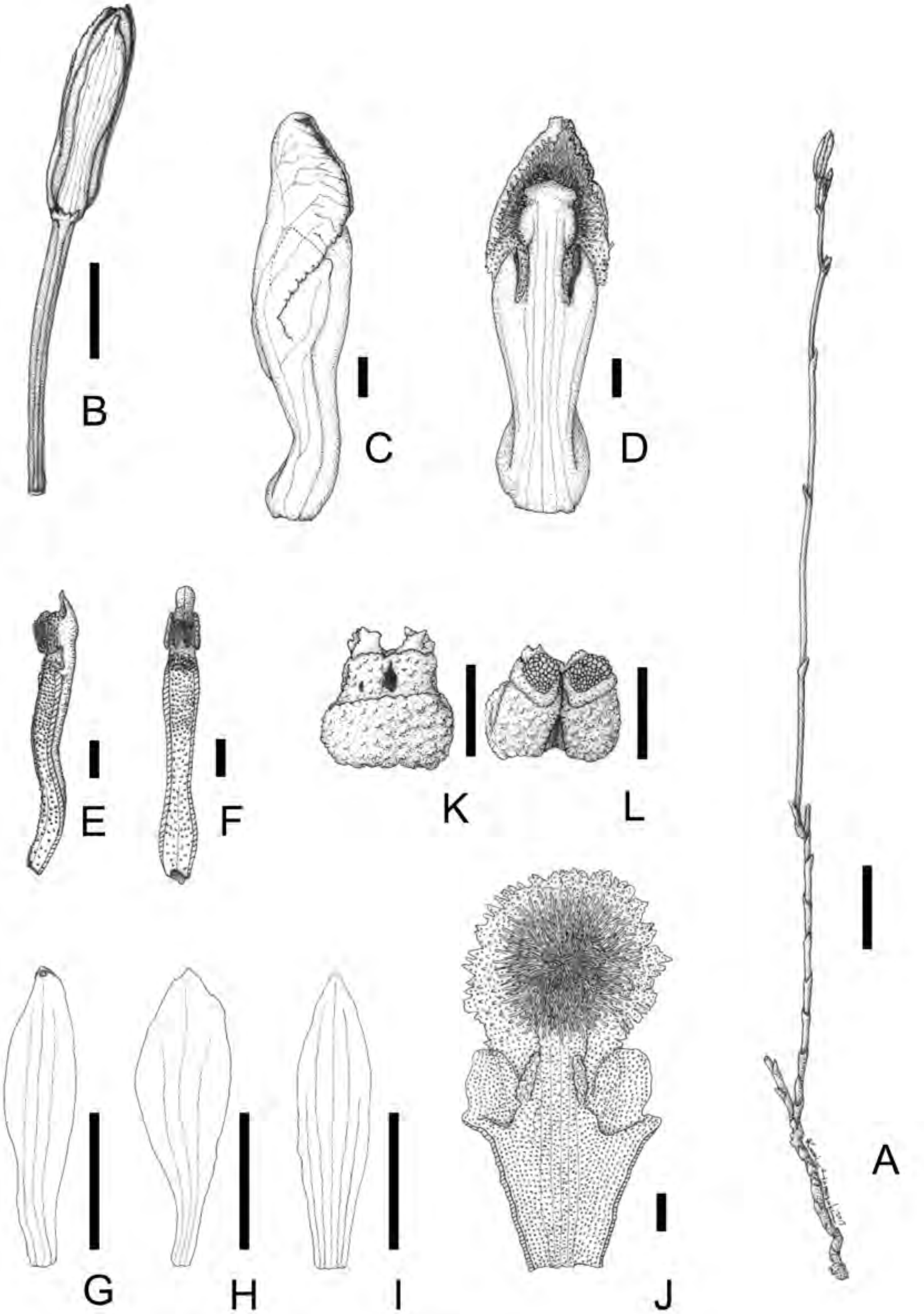

FIG. 2. *Lecanorchis triloba* var. *clausa*. A. Flowering habit. B. Flower and pedicellate ovary. C–D. Lip and column (C, side view; D, front view). E–F. Column (E, side view; F, back view). G. Dorsal sepal. H. Lateral petal. I. Lateral sepal. J. Flattened lip. K–L. Anther cap. A. Bar = 3 cm. B, G–I. Bar = 5 mm. C–F, J–L. Bar = 1 mm. Line drawings by Kumi Hamasaki.

face and column wings; stigma projecting, forming an erect plate, hairy. Anther ca. 1.2 mm wide, minutely papillose. Capsule ascending to erect, ca. 12 mm long.

Distribution. The distribution of *Lecanorchis triloba* var. *clausa* appears to be restricted to the single population in the Kunigami Village. The population is located in humid, evergreen, broad-leaved forests dominated by *Castanopsis sieboldii* (Makino) Hatus. ex T. Yamaz. & Mashiba. Dozens of individuals have been found within an area of less than 100 m^2.

Note. Lecanorchis triloba var. *clausa* closely resembles *L. triloba* var. *triloba*, with both having frequently branched inflorescences, densely flowered rachis and small flowers and fruits. However, the flowers of *L. triloba* var. *clausa* remain completely closed throughout the entire flowering period (Fig. 1; https://www.youtube.com/watch?v=xE9q7eV5RyE). Although cleistogamous plants usually exhibit a mixed pollination strategy, also bearing chasmogamous flowers for open pollination (reviewed by Culley & Klooster 2007), the 21 flowers from 12 flowering plants we examined of *L. triloba* var. *clausa* produce only cleistogamous flowers.

Lecanorchis triloba var. *clausa* also differs from *L. triloba* var. *triloba* in having a narrowly triangular non-recurved midlobe ca. 5 mm long and ca. 3 mm wide with fewer hairs (v. s. shortly obovate recurved midlobe ca. 5 mm long and ca. 5 mm wide and more hairy). In addition, the calli of *L. triloba* var. *clausa* are smaller than those of *L. triloba* var. *triloba* (Fig. 2). We therefore concluded that the Okinawan individuals should be treated as distinct from *L. triloba* var. *triloba.*

It should be noted that *Lecanorchis nigricans* also produces both cleistogamous and chasmogamous varieties. While *L. nigricans* var. *patipetala* has often been treated as a synonym of *L. nigricans* var. *nigricans* (e.g. Hashimoto 1990, Yokota *et al*. 2016), *L. nigricans* var. *nigricans* produces only cleistogamous flowers, and is distinct from the chasmogamous varieties *L. nigricans* var. *patipetala* and *L. nigricans* var. *yakusimensis* (Honda 1931, Sawa 1980, Suetsugu *et al*. 2018).

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